



# High Current Vacuum Insulated Tandem Accelerator

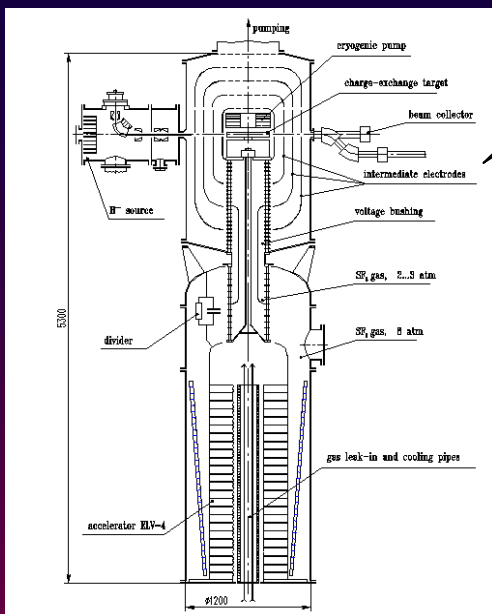
J. Paul Farrell  
Brookhaven Technology Group, Inc.

## Application of Nuclear Reactions to Anti-Terrorism

- $^{13}\text{C}(p,\gamma)^{14}\text{N}$  MeV Photons for Nuclear Resonance Absorption (NRA)  
 $^{19}\text{F}(p,\alpha^+e^-)^{16}\text{O}$  Positrons for producing tunable source of MeV photons by In-flight Annihilation for NRA  
 $^{19}\text{F}(p,\alpha\gamma)^{16}\text{O}^*$  MeV Photons for Photon Induced Positron Annihilation (PIPA)<sup>1</sup>  
 $^7\text{Li}(p,n)^7\text{Be}$  Epithermal to MeV Neutrons

I. Positron Systems, Inc.  
6151 N. Discovery Way  
Boise, ID 83713

## VITAN Vacuum Insulated Tandem



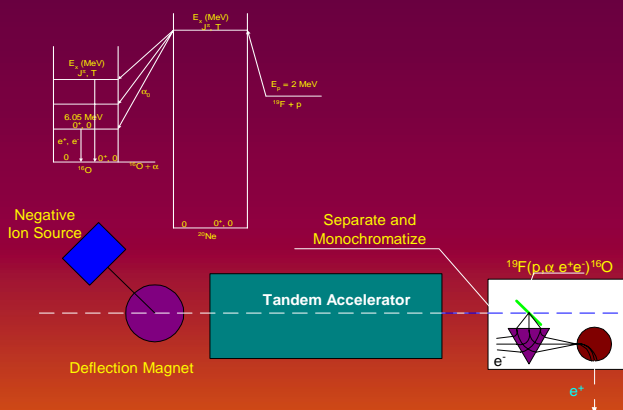
Proton Energy up to 2.5 MeV

$\Delta E/E \approx 0.1\%$

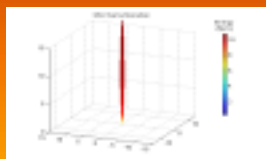
Proton current up to 10 mA

### Features

- No glass or ceramic accelerating columns for beam transport. The charge exchange canal is situated in a large vacuum tank and high voltage is applied to it through an insulating column that is remote from the transport region of the high current ion beam.
- The gas stripper canal is surrounded by a system of coaxial cylindrical shields that provide an optimum potential gradient for beam focusing and for grading the potential to prevent high voltage discharge.
- Apertures in the walls of the vacuum tank and in the coaxial shields permit passage and provide focusing of the accelerated beam.
- Most of the focusing in the acceleration region is due to the strong focusing lens at the entrance to the vacuum vessel where the beam has low energy.
- The efficient pumping of the inner cavity which contains the gas stripper is accomplished by the combination of cryogenic recirculating pump in the vacuum vessel and conventional turbo-molecular pumping through the removable covers of the cylindrical shields.
- Covers are vacuum transparent because they possess a large number of openings.

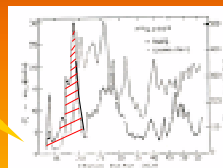


$Ed\sigma/d\Omega$



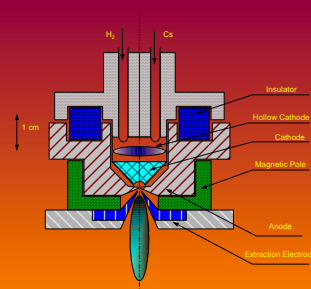
Spectrum and angular distribution of photons from in-flight annihilation of positrons at an energy of 8. MeV

Cross section for pair production



### H- Ion Source

- High brightness ( $I/e^2$ )
- High efficiency
- High reliability
- Current > 10 mA DC



Presented by:

Brookhaven Technology Group, Inc.  
12 Technology Drive  
Setauket, NY 11733  
[www.brookhaventech.com](http://www.brookhaventech.com)